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Science and Art Gossip.

This week, owing to pressure on our space from British Association matter, we omit the Weather Charts, Our Mathematical Column, and Whist. With regard to the first, we may note that many readers complain of the space occupied by these charts, "which tell us, after all," they write, "only of past bad weather." The charts were intended to form a collection of weather records, convenient in form, and useful for future reference. Their scale, indeed, is rather small; but no more space could be spared. For our own part, we should be only too glad to devote the space they occupy to other matter. We shall leave our readers to decide. If we find that far the larger portion would prefer that these charts should be omitted and other matter replace them, we shall attend to their wish. Only a certain amount of space, of course, can be spared (on the average) for weekly illustrations. If these charts disappear, other illustrations, probably more useful, will replace them. Of one thing our readers can be assured; we wish to meet their wishes, so far as is consistent with our scope and purport, to the utmost of our power. Our power is limited to some degree by our price; but we do not propose to increase it by any change in that direction. Still we must note that *some* of our readers ask us to do much more than could be afforded without such a change. We adhere as far as we can to our original plan and purpose. We warmly thank those who have helped to increase the circulation of Knowledge; but when many write saying that the new subscribers they have obtained want "more astronomy," say some, "more electricity," say others, more chemistry, biology, botany, entomology, metallurgy, geology, &c., &c., &c., and more illustrations, and when we find that a weekly as large as one of our monthly magazines would barely meet all these views—we find ourselves rather at a loss what to do for the best.

A joke fifteen months old has but now come to my knowledge. When I purchased from Messrs. Smith, Elder, & Co., their rights in my three books—"The Borderland of Science," "Science By-ways," and "The Poetry of Astronomy"—they sent me (September 2) their collection of the press criticisms of those books, mostly new to me. By the merest accident (for life is too short to read press criticism) in turning these over I came across the following odd illustration of the profundity of the *Saturday Review*, and the wide reading of the learned writers who "do" its criticisms. The *Saturday Review* for May 28, 1881, dealing with my "Poetry of Astronomy," questions whether I can be a judge of poetry, for this solitary and also singular reason—"Of the fineness of Mr. Proctor's ear, we may to some extent judge," it says, with fine irony, "from his selecting for quotation a specimen of rhyme so exquisite as—

> expanse of liquid, pure,
> Transparent elemental air."

It takes the *Saturday Review* to explain how badly Milton rhymed in the "Paradise Lost!" We can imagine a criticism of that work two centuries ago, if the *Saturday Review* had but existed then:—"We learn that the author is blind; he must be deaf, too; at any rate we may to some extent judge of the fineness of his ear from a specimen of rhyme so exquisite as

> Hail, holy light! Offspring of Heav'n first-born,
> Or of th' Eternal Coeternal beam."

But, unfortunately for Milton, there was no *Saturday Review* to teach him how to write poetry, as they have taught Browning and Tennyson.

In the report of the Anthropometric Committee of the British Association (presented by Sir Rawson Rawson), it is stated that the greatest stature is found in Scotland and the North of England, and the shortest in Wales, the Welsh border counties, and the south-west of England. The counties inhabited by men of more purely Saxon descent are of medium stature. Allowing for the ethnological difference just mentioned, the inhabitants of elevated districts possess a greater stature than those of alluvial plains. The highest stature in the country is 70 inches, and the lowest 66. Sir Rawson Rawson added that the average stature of the Scotch people is 68·71, of the Irish 67·90, of the English 67·36, and of the Welsh 66·66 in. The average of the United Kingdom is according to this 67·66, or 5 ft. 7⅝ in. From observations made by Dr. Baxter and others in America, it has been found that the average height of our transatlantic cousins is just about the same as ours. Generally, it might be said that not only in England, but in Europe, stature seems to diminish with the latitude of the race. Professor Roberts said he considered that the size and activity of the brain have much to do with physique; others suggested that the use of tobacco arrests growth; and Mr. Sclater-Booth remarked that climate, elevation, distance from sea, occupation, diet, and smoking modify growth.

"Great difference exists," said Professor Leoni Levi at the late meeting of the British Association, "in the classes of crimes and offences in England, Scotland, and Ireland respectively. Honour and property are safest in Ireland; the person is safest in Great Britain; drunkenness is worst in Ireland. Geographically crime is least in the north, midland, and south-eastern counties, and most in the north-western. The agricultural counties have less crime than the manufacturing and mineral. Crime following the density of population, the bulk of our criminals consist of persons having no occupation and common labourers, whose means are precarious; hence the relation of crime to savings and wealth is very intimate. The number of persons committed for trial in England and Wales in 1880 was 19 per

cent. less than in Scotland, and 53 per cent. less than in Ireland, and so the amounts of deposits in the savings banks is 30 per cent. more in England and Wales than it is in Scotland, and 73 per cent. more than in Ireland. Prosperity moves hand in hand with virtue; misery with oppression and crime. The bulk of criminals are generally found to be illiterate, and drunkenness is both a direct and indirect cause of crime. Family dissensions are found to contribute a large *quota* to crime, and an ever active cause is the existence of the criminal classes."

In a letter to the *Times*, "Some of the Victims" write:—"As many of your readers will now be visiting localities where valuable pebbles are said to abound, it is as well to warn them before having them cut that much deception is practised. We have been spending a month at a well-known watering-place in Wales, and while there picked up stones on the beach, said by the principal lapidary in the town to be beautiful amethysts, topazes, and crystals. Some of those selected by him we had cut as specimens, others we had mounted. Upon showing the uncut pebbles to an eminent geologist he pronounced them to be pieces of quartz, and told us that the lapidaries substitute real stones imported from Germany in lieu of those they receive from the visitors. He says it is possible to find coloured crystals in the rocks of the neighbourhood and on the beach, but they would be quite transparent when divided, which was not the case with those we found."

An Eighty Pound Hailstone.—Considerable excitement was caused in our city last Tuesday evening by the announcement that a hailstone weighing eighty pounds had fallen six miles west of Salina, near the railroad track. An inquiry into the matter revealed the following facts:—A party of railroad section men were at work Tuesday afternoon several miles west of town, when the hailstorm came upon them. Mr. Martin Ellwood, the foreman of the party, relates that near where they were at work hailstones of the weight of four or five pounds were falling, and that returning towards Salina the stones increased in size, until his party discovered a huge mass of ice weighing, as near as he could judge, in the neighbourhood of eighty pounds. At this place the party found the ground covered with hail as if a wintry storm had passed over the land. Besides securing the mammoth chunk of ice, Mr. Ellwood secured a hailstone something over a foot long, three or four inches in diameter, and shaped like a cigar. These "specimens" were placed upon a hand car and brought to Salina. Mr. W. J. Hagler, the North Santa Fé, merchant, became the possessor of the larger piece, and saved it from dissolving by placing it in sawdust at his store. Crowds of people went down to see it, and many were the theories concerning the mysterious visitor. At evening its dimensions were 29 × 16 × 2 inches.—*Salina (Kansas) Journal.*

Hearing the Aurora by Telephone.—An observer of the recent aurora at Mont Clair, N. J., Aug. 4, writes that on connecting the two poles of his telephone, one with the water-pipe leading to cistern near his dwelling, and one with the gas-pipe leading all over town, he heard the electrical crackle going on, substantially the same as is heard when the same connection is made during thunderstorms. He, however, reports that the auroral crackle was more delicate in its sound than the thunderstorm crackle, and that beside the crackle there were at intervals, of perhaps half-a-second each, separate short taps on the telephone diaphragm that gave a slight ringing sound.

Important Oriental Manuscripts.—The trustees of the British Museum have acquired a most important collection of Oriental manuscripts, consisting of 138 volumes, more or less fragmentary, containing (1) Arabic commentaries of the Bible, with the Hebrew text written by Karaite Jews; (2) liturgies and hymns both of the Karaites and the Rabbinic Jews; (3) Karaite polemical treatises; and (4) grammatical, lexicographical, and philosophical treatises. Among the commentaries with the Hebrew text are some of the highest importance. They rank among the oldest Arabic manuscripts hitherto known. Three are dated A.H. 348=A.D. 959, A.H. 395=A.D. 1004, and A.H, 437=A.D. 1045. The British Museum has hitherto possessed only one single manuscript of this kind, dated A.H. 398=A.D. 1007. Besides being of so early a date, these manuscripts show the cause of the law laid down in the Talmud, "that the sacred Scriptures must not be written in any than the square Hebrew characters." They demonstrate for the first time that the Jews were in the habit of writing the Scriptures in other characters. Another point of extreme interest to the Oriental student is the fact that, though the commentaries are written in Arabic, they contain large quotations from Anan's commentaries in Aramaic, thus proving beyond doubt that Anan, the founder of the Karaites, wrote in Aramaic—the language spoken in Palestine in the time of Christ.

Buried Cities in Greece.—Dr. Schliemann is carrying on new excavations at Hissarlik, with the assistance of two eminent German architects. No fewer than 150 workmen are daily employed in laying bare the foundation of the ancient cities. Two perfectly distinct cities have lately been discovered in the burnt stratum, the lower one resting on the large walls which have hitherto by mistake been attributed to the second city. Hissarlik now turns out to have been the Acropolis of this lower burnt city, this being proved by the walls and the pottery, as well as by two vast brick buildings, one of them 43 ft. broad by 100 ft. long, the other 23 ft. broad by less than 100 ft. long. These buildings seem to have been temples, a separate gateway, flanked by enormous towers, leading up to them. There are, besides, three or four large buildings, apparently dwelling-houses, but no smaller buildings. The city walls now stand out very imposing. They rest on a substructure of large blocks, 33 ft. high, afterwards superseded by great brick walls. All the treasures formerly found by Dr. Schliemann are now ascribed to the first burnt city. Dr. Schliemann has found in the temples copper nails of a very peculiar shape, weighing from 1,000 to 1,190 grammes. The second burnt city, being the third city from the rock, and hitherto identified with the Homeric Troy, turns out to have had but very small houses, and no lower town at all. Dr. Schliemann will continue his excavations till the beginning of August.

THE BRITISH ASSOCIATION.

By the Editor.

AS I write the British Association meeting is drawing to a close. The final meeting of the General Committee has been held, mutual congratulations and laudations have been exchanged, and the sum of £1,286 raised on this occasion has been appropriated (all but a small balance for outside expenses) in grants "for scientific purposes." British Association science is disposed to rest and be satisfied (for the present); Southampton, if not altogether satisfied, has had quite enough of science, and is

disposed to rest too. At the closing *soirée*, given by the Mayor and Corporation of the "good old town," as the former, with startling originality, calls Southampton, there was a crush, and finally a dance, in which somehow the dancers seemed to be shaking the dust of science from their feet.*

The next meeting is to be held at Southport, opening on September 19; and according to present plans, the meeting of 1884 is to be held in Canada! One of the greatest mathematicians living, Professor Cayley, of Cambridge, will be present at the meeting of 1883, which, had an Oxford man been appointed president, was to have been held at Oxford: as it is, the invitation of Oxford has been "postponed." *Tantæ*, &c.

Geology.

From the address of Mr. Etheridge, I extract the following passage, as of interest:—

"In Selsea I draw attention to a locality where historical evidence is based upon physical causes and changes that have long been, and still are going on, to modify the form, extent, and structure of the Sussex coast, from the mouth of Chichester Harbour to Littlehampton and Bognor. The peninsula of Selsea is celebrated in English history as one of the places where Christianity was first taught in this country. It was one of the most ancient Saxon establishments. This peninsula was granted by Edilwalch, King of the South Saxons, to Wilfred, the exiled Bishop of York, about the year 680. At that time it is stated to have contained 5,220 acres of land, with 85 families and 250 slaves. The parish now contains only 2,880 acres; 2,340 having been slowly denuded away by the action and encroachment of the sea. This encroachment and destruction during the past 800 years has been very extensive. The creek called Pagham Harbour, on the south-east side of the Bill or peninsula, was due to an irruption before the year 1345, when 2,700 acres of land were destroyed. The site of the ancient cathedral and episcopal palace of Selsea, believed to have been situated to the south-east of the present church of Pagham, is no longer to be determined, but there is no reason to doubt but that it stood nearly a mile out in what is now sea. We are led to believe that when Selsea became known to the English nation it was an island, and that in Bede's time the process of silting up the estuary must have commenced, and the completion of this process would seem to have been before the Conquest. The action of the tides on this coast carries the sand and shingle from west to east, therefore the gradual wasting which has taken place on the shore of Bracklesham Bay has served to supply a large portion of the material of which these marshes are formed. The ground on which Selsea, Bognor, Littlehampton, Worthing, and other places on the Sussex coast westward of Brighton are built, is of very recent formation, being composed of gravels, sands, and loam belonging to the post-pleiocene or pleistocene series."

Biology.

Professor Gamgee, in his opening address, gave a long, elaborate, and, to say the truth, rather wearisome account of scientific researches into the process of secretion. Our readers, except specialists (who, however, we trust, read Knowledge rather for simple accounts of matter outside their special department, than for such specialistic papers as would weary all other readers) would not thank us for more than the following brief summary:—

"Elaborate studies made by science into the process of secretion "have brought into greater prominence the dignity, if one may use the expression, of the individual cell. The process of secretion appears as the result of the combined work of a large number of these units. Each, after the manner of an independent organism, uses oxygen, forms CO_2, evolves heat, and derives its nutriment from the medium in which it lives, and performs chemical operations of which the results only are imperfectly known to us, and which depend upon peculiar endowments of the cell protoplasm, of which the causes are hidden from us. So long as the protoplasm is living, the gland cell retains its power of discharging its functions, and in many cases does so, so long as the intercellular liquid furnishes it with the materials required. In some cases, however, the gland cells are specially sensitive to a variation in the composition of the nutrient liquid, certain constituents of which appear to stimulate the protoplasm to increased activity. In the higher animals the cells, particularly in certain glands, are in relation to nerves which, when stimulated, affect in a remarkable manner the transformations of their protoplasm, leading to an increased consumption of oxygen, an increased production of carbonic acid, an increased evolution of heat, and an increased production of those matters which the cell eliminates, and which constitute its secretion."

Zoology.

Professor Lawson, in his address on Zoology, chiefly of a very technical character, made the following remarks on the work of the great naturalist we have lately lost:—

"Many now present would never forget the intense excitement which took place in the early days of the doctrine of evolution, and the manner in which Darwin's views were met at the meetings held at Oxford, Cambridge, Norwich, and Exeter. In those days whatever Darwin advanced was viewed with hatred and suspicion, and the popular mind only saw in his works that which tended to overthrow established beliefs in the existence of a Creator. But all the bitter attacks made upon him he met with silence, and never resorted to angry retort, for he could afford to disregard contumely and misrepresentation. The members of this department would also remember how, year by year, these attacks grew less frequent and bitter, and wholesale denunciation gave place to intelligent questioning, until at last Darwin's views were generally accepted by all scientists and inquiring minds as accurate, and a few months ago his coffin was followed, not only by scientists and laymen, but by clergymen of all denominations, many of whom, no doubt, thus sought to atone for the many unjust things which they themselves thought and said about him when they themselves were not really acquainted with the object of his labours. Darwin had the good fortune to live to see his doctrines promulgated, and almost universally accepted. All naturalists regarded him with an admiration and respect accorded to no naturalist since the days of Linnæus."

Intelligence in Animals.—An acquaintance placed his parrot on the lawn to watch the people. A large cat walked up to make its acquaintance. "Thwish, wish, go away!" Cat declines, goes closer. "Rough, Rough, come here!" (whistles). Rough comes, cat departs.—John Alex. Ollard, F.R.M.S.

* In passing it may be noted that, had it been possible, some other place than the Hartley Institution should have been chosen for the *soirées*, as the Institute had to be closed for a whole day before each, and it is the only place in the "good old town" where there is anything like a library, with such works of reference as men of science value. "Closed for decorations," the janitor's answer to visitors at these times, led to the suggestion that the Institute was not primarily intended for *soirées*; though, indeed, there was nothing in the way of decorations which might not have been arranged by active assistants in an hour or two.

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PROFESSOR BOYD DAWKINS ON RIVER DRIFT MAN.

THE following is an abstract of Professor Boyd Dawkins's address to the department of Anthropology, or at least of that portion of it which relates to our Pleistocene ancestor, River Drift Man—a term not meaning, by-the-way, as many (we find) imagine, a being who passed the principal part of his time in drifting about rivers, but man in that stage of human development whereof the chief evidence we have is found in river drift.

The characteristics of the evolution of living forms may be summed up as follows :—

I. Eocene—in which the placental mammals now on earth were represented by allied forms belonging to existing orders and families. Living orders and families appear; lemurs (*lemuridæ*) in Europe and North America. Evidence found in fresh-water and marine strata; lignites.

II. Miocene—in which the alliance between living and placental mammals is more close than before. Living genera appear; apes (*simiadæ*) in Europe and North America. Evidence — fresh-water and marine strata; volcanic *débris* (Auvergne); lignites.

III. Pliocene—in which living species of placental mammals appear. Living species appear; apes, *simiadæ*, in Southern Europe. Evidence found in fresh-water and marine strata; volcanic *débris* (Auvergne).

IV. Pleistocene—in which living species of placental mammals are more abundant than the extinct. Man appears; *anthropidæ*; the palæolithic hunter; living species abundant. Evidence—refuse-heaps, contents of caves, river deposits, sub-marine forests, boulder clay, moraines, marine sands, and shingle.

V.—Prehistoric—in which domestic animals and cultivated fruits appear. Man abundant, domestic animals, cultivated fruits, spinning, weaving, pottery making, mining, commerce; the neolithic, bronze, and iron stages of culture. Evidence—camps, habitations, tombs, refuse-heaps, surface accumulation, caves, alluvia, peat bogs, submarine forests, raised beaches.

VI. Historic—in which the events are recorded in history. Evidence—documents, refuse heaps, caves, tombs.

The orders, families, genera, and species in the above summary, when traced forward in time, fall into the shape of a genealogical tree, with its trunk hidden in the secondary period, and its branchlets (the living species) passing upwards from the Pliocene, a tree of life, with living mammalia for its fruits and foliage. Were the extinct species taken into account, it would be seen that they fill up the intervals separating one living form from another, and that they too grow more and more like the living forms as they approach nearer to the present day. It must be remembered that in the above definitions the fossil marsupials are purposely ignored, because they began their specialization in the secondary period, and had arrived in the Eocene at the stage which is marked by the presence of a living genus—the opossum (*Didelphys*).

It will be seen that our inquiry into the antiquity of man is limited to the last four of the divisions. The most specialised of all animals cannot be looked for until the higher mammalia by which he is now surrounded were alive. We cannot imagine him in the Eocene age, at a time when animal life was not sufficiently differentiated to present us with any living genera of placental mammals. Nor is there any probability of his having appeared on the earth in the Miocene, because of the absence of higher placental mammals belonging to living species. It is most unlikely that man should have belonged to a fauna in which no other living species of mammal was present. He belongs to a more advanced stage of evolution than the mid-Miocene of Thenay. Up to this time the evolution of the animal kingdom had advanced no further than the *Simiadæ* in the direction of man*; and the apes then haunting the forests of Italy, France, and Germany represent the highest type of those on the earth.

We may also look at the question from another point of view. If man were upon the earth in the Miocene age, it is incredible that he should not have become something else in the long lapse of ages, and during the changes in the conditions of life, by which all the Miocene land mammalia have been so profoundly affected, that they have been either exterminated, or have assumed new forms. Nor in the succeeding Pliocene age can we expect to find man upon the earth, because of the very few living species of placental mammals then alive. It is not until we arrive at the succeeding stage, or the Pleistocene, when living species of mammalia begin to abound, that we meet with indisputable traces of the presence of man on the earth.* The rudely chipped implements of the River-drift hunter lie scattered through the late Pleistocene river deposits in Southern and Eastern England in enormous abundance, and as a rule in association with the remains of animals of Arctic and of warm habit, as well as some or other of the extinct species of reindeer and hippopotamus along with mammoth and woolly rhinoceros.

The geographical change in Northern Europe at the close of the Forest-bed age was very great. The forest of the North Sea sank beneath the waves, and Britain was depressed to a depth of no less than 2,300 ft. in the Welsh mountains, and was reduced to an archipelago of islands, composed of what are now the higher lands. The area of the English Channel also was depressed, and the "silver streak" was wider than it is now, as is proved by the raised beach at Brighton, at Bracklesham, and elsewhere, which marks the sea-line of the largest island of the Archipelago, the Southern Island, as it may be termed, the northern shores of which extended along a line passing from Bristol to London. The northern shore of the Continent at this time extended eastwards from Abbeville, north of the Erzgebirge, through Saxony and Poland, into the middle of Russia, Scandinavia being an island from which the glaciers descended into the sea. This geographical change was accompanied by a corresponding change in climate. Glaciers descended from the higher mountains to the sea level, and icebergs, melting as they passed southwards, deposited their burdens of clay, sand, and erratics, which occupy such a wide area in the portions then submerged of Britain and the Continent. This depression was followed by a re-elevation, by which the British Isles, a part of the Continent, and all the large tract of country within the 100-fathom line, again became the feeding-grounds of the late Pleistocene mammalia.

An appeal to the animals associated with the River-drift implements will not help us to fix the exact relation of man to these changes, because they were in Britain before as well as after the submergence, and were living throughout in those parts of Europe which were not submerged. It can only be done in areas where the submergence is clearly defined. At Salisbury, for instance, the River-

* The Pleistocene period is the equivalent of the Quaternary of the French, and the Postpliocene of the older works of Lyell, and including all the phenomena known in latitudes outside the Arctic Circle, where ice no longer is to be found, under the name of glacial and inter-glacial.

drift hunter may have lived either before, during, or after the southern counties became an island. When, however, he hunted the woolly and leptorhine rhinoceros, the mammoth, and the horse, in the neighbourhood of Brighton, he looked down upon a broad expanse of sea, in the spring flecked with small icebergs such as those which dropped their burdens in Bracklesham Bay. At Abbeville, too, he hunted the mammoth, reindeer, and horse down to the mouth of the Somme on the shore of the glacial sea. The evidence is equally clear that the River-drift hunter followed the chase in Britain after it had emerged from beneath the waters of the glacial sea, from the fact that the river deposits in which his implements occur either rest upon the glacial clays, or are composed of fragments derived from them, as in the oft-quoted cases of Hoxne and Bedford. Further, it is very probable that he may have wandered close up to the edges of the glaciers then covering the higher hills of Wales and the Pennine chain. The severity of the climate in winter at this time in Britain is proved, not merely by the presence of the Arctic animals, but by the numerous ice-borne blocks in the river gravels dropped in the spring after the break-up of the frosts.

The River-drift man is proved, by the implements which he left behind, to have wandered over the whole of France, and to have hunted the same animals in the valley of the Loire and the Garonne, as in the valley of the Thames. In the Iberian peninsula he was a contemporary of the African elephant, the mammoth, and the straight-tusked elephant, and he occupied the neighbourhood both of Madrid and Lisbon. He also ranged over Italy, leaving traces of his presence in the Abruzzo, and in Greece he was a contemporary of the extinct pigmy hippopotamus (*H. Pentlandi*). South of the Mediterranean his implements have been met with in Oran, and near Kolea in Algeria, and in Egypt in several localities. At Luxor they have been discovered by General Pitt-Rivers in the breccia, out of which are hewn the tombs of the kings. In Palestine they have been obtained by the Abbé Richard between Mount Tabor and the sea of Tiberias, and by Mr. Stopes between Jerusalem and Bethlehem. Throughout this wide area the implements, for the most part of flint or of quartzite, are of the same rude types, and there is no difference to be noted between the *haches* found in the caves of Cresswell, in Derbyshire, and those of Thebes, or between those of the valley of the Somme and those of Palestine. The River-drift hunter ranged over the Indian peninsula from Madras as far north as the valley of the Nerbudda. Here we find him forming part of a fauna in which there are species now living in India, such as the Indian rhinoceros and the arnee, and extinct types of oxen and elephants. There were two extinct hippopotami in the rivers, and living gavials, turtles, and tortoises. It is plain, therefore, that at this time the fauna of India stood in the same relation to the present fauna as the European fauna of the late Pleistocene does to that now living in Europe. In both there was a familiar association of extinct and living forms, from both the genus *Hippopotamus* has disappeared in the lapse of time, and in both man forms the central figure.

We are led from the region of tropical India to the banks of the Delaware, in New Jersey, by the recent discoveries of Dr. C. C. Abbott. Here, too, living and extinct species are found side by side.

Thus in our survey of the group of animals surrounding man when he first appeared in Europe, India, and North America, we see that in all three regions, so widely removed from each other, the animal life was in the same stage of evolution, and "the old order" was yielding "place unto the new." The River-drift man is proved by his surroundings to belong to the Pleistocene age in all three. The evidence of Palæolithic man in South Africa seems to me unsatisfactory, because as yet the age of the deposits in which the implements are found has not been decided.

The identity of the implements of the River-drift hunter proves that he was in the same rude state of civilisation, if it can be called civilisation, in the old and new worlds, when the hands of the geological clock pointed to the same hour. It is not a little strange that his mode of life should have been the same in the forests to the north and south of the Mediterranean, in Palestine, in the tropical forests of India, and on the western shores of the Atlantic. The hunter of the reindeer in the valley of the Delaware was to all intents and purposes the same sort of savage as the hunter of the reindeer on the banks of the Wiley or of the Solent.

It does not, however, follow that this identity of implements implies that the same race of men were spread over this vast tract. It points rather to a primeval condition of savagery from which mankind has emerged in the long ages which separate it from our own time. It may further be inferred, from his widespread range, that the River-drift man (assuming that mankind sprang from one centre) must have inhabited the earth for a long time, and that his dispersal took place before the glacial submergence and the lowering of the temperature in Northern Europe, Asia, and America. It is not reasonable to suppose that the Straits of Behring would have offered a free passage, either to the River-drift man from Asia to America, or to American animals from America to Europe, or *vice versâ*, while there was a vast barrier of ice or of sea, or of both, in the high northern latitudes. I therefore feel inclined to view the River-drift man as having invaded Europe in pre-glacial time along with the other living species which then appeared. The evidence, as I have already pointed out, is conclusive that he was also glacial and post-glacial.

In all probability the birthplace of man was in a warm, if not a tropical, region of Asia—in "a garden of Eden;" and from this the River-drift man found his way into those regions where his implements occur. In India he was a member of a tropical fauna, and his distribution in Europe and along the shores of the Mediterranean prove him to have belonged either to the temperate or the southern fauna in those regions. It will naturally be asked, to what race can the River-drift man be referred? The question, in my opinion, cannot be answered in the present stage of the inquiry, because the few fragments of human bones discovered along with the implements are too imperfect to afford any clue. Nor can we measure the interval in terms of years which separates the River-drift man from the present day, either by assuming that the glacial period was due to astronomical causes, and then proceeding to calculate the time necessary for them to produce their result, or by an appeal to the erosion of valleys, or the retrocession of waterfalls. The interval must, however, have been very great to allow of the changes in geography and climate, and the distribution of animals which has taken place—the succession of races, and the development of civilisation before history began. Standing before the rock-hewn tombs of the kings at Luxor, we may realise the impossibility of fixing the time when the River-drift hunter lived in the site of the ancient Thebes, or of measuring the lapse of time between his days and the splendour of the civilisation of Egypt. In this inquiry I have purposely omitted all reference to the successor of the River-drift man in Europe—the Cave man, who was in a higher stage of the hunter civilisation. In the course of my remarks you will have seen that the story

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told by the rudely chipped implements found at our very door in this place (Southampton), forms a part of the wider story of the first appearance of man, and of his distribution on the earth.

WAS RAMESES II. THE PHARAOH OF THE OPPRESSION?

By Miss Amelia B. Edwards.

VIII.—CONDITIONS OF PLACE AND DATE.

WHETHER the mounds of Tel-el-Maskhuta* do, or do not, cover the ruins of the city of "Raamses" is a question which can, perhaps, only be placed beyond dispute by the spade of the excavator; but, pending that final test (which I trust is not far distant), the evidence in its favour is undoubtedly very much stronger than any which can be adduced in favour of the other sites before mentioned. And, strong as it is, I scarcely think that every point in that evidence—unless very cursorily by myself,† more than two years ago—has yet been fairly stated.

Before proceeding to examine that evidence, however, it will be well first to note the conditions which have to be fulfilled by any sites claiming to represent the "treasure-cities" of the Bible, and then to see how far these conditions agree with the sites advocated by Herr Brugsch, M. Chabas, and others; namely, Tanis, Pelusium, Heliopolis, Babloon, and Toossoom.

1. We have to look for two "treasure-cities," or Bekhennu, dating from the reign of Rameses II.; *new* cities, be it observed, "built for Pharaoh," like so many others during that reign.

2. We have to look for them (for the reasons already stated) in the land of Goshen; a district also known at and after the time of Moses as "the land of Rameses."

3. Being twin-cities, the one sacred to Tum, the other sacred to Ra (in the divine person of Rameses), with, as it were, an inter-dependent worship, we may reasonably expect to find them somewhat near together.

Now, as regards the first condition, that of newness:—Tanis (Zoan), which Brugsch absolutely identifies with Raamses, must be at once rejected; for the sanctuary of the Great Temple was as old as the excessively remote period of the VIth dynasty; besides which, the mounds of Zoan are to this day strewn with remains dating from the XIIth and XIIIth dynasties, and with remains of the Hykshos period, all many centuries earlier than Rameses II. Furthermore we have the authority of the Bible (Numbers xiii., 22) for the fact that "Hebron was built seven years before Zoan in Egypt;" Hebron being a place as old as the times of Abraham. Of Pelusium we cannot speak positively, for the original Egyptian name and early history of this city are unknown; but Heliopolis was certainly older than Rameses II. by something like sixteen hundred years. The great temple of Heliopolis was, at all events, founded by Usertesen I., second Pharaoh of the XIIth dynasty. Babloon, a stout old fortress of the Roman period, built in genuine Roman fashion in courses of thin red bricks, is just as much too modern as Heliopolis is too old; and Toossoom, which consists of a few unimportant remains on a sandy height at the S.E. extremity of Lake Timsah, going from Ismailiah to Suez by the canal, is altogether inadmissible.

Our second condition is that Pa-Rameses and Pa-Tum shall be situate in the Land of Goshen. Again, therefore, Tanis must be rejected; for Tanis, the capital of the province known to the Greeks as the Nome Tanites (of which the Egyptian name was Khent-Abot) is certainly not in the Land of Goshen. Neither is Heracleopolis Parva, which Brugsch identifies with Pa-Tum (Pithom), and which is represented by a mound close upon the marshy shores of Lake Menzaleh, in a district of which the ancient provincial classification is unknown. Herr Brugsch, according to a proposed derivation which we will presently examine, believes this part of the sea-board of the Delta to form part of the ancient Sethroïtic Nome; but the position of the Sethroïtic Nome has yet to be determined. Pelusium, which M. Chabas identifies with "Raamses," and Etham, which he identifies with "Pithom," are neither of them in the Land of Goshen, but lie off upon the coasts near the Pelusiac mouth of the Nile, in that same district which Brugsch ascribes to the Sethroïtic Nome. And as for Heliopolis, the capital of the Heliopolitan Nome, and Babloon, the Roman fortress already mentioned, so far from being situate in the Land of Goshen, the one is but five miles from Cairo, and the other is a part of Cairo, or rather of ancient Fostât, just outside Cairo.

Lastly, we may expect to find "Raamses" and "Pithom" not very far apart. Pelusium and Etham, Tanis, and the mound by Lake Menzaleh, are within a moderate distance of each other, and so fairly meet the requirements of the case. But Heliopolis and the rest stand alone; and even those who recognise Pa-Rameses in one or another of them, have no neighbouring mounds to propose for the companion site of Pa-Tum.

To sum up:—Pa-Rameses was a "treasure city" founded by Rameses II. in the land of Goshen. Neither Tanis, Heliopolis, nor Babloon were either founded by Rameses II. or situate in the land of Goshen. Of the foundation of Pelusium, and of its Egyptian name, we are ignorant; but it was not situate in the Land of Goshen. Of Toossoom we know nothing, save the insignificance of its remains, the improbability of its position, and the fact that it was in the Arabian Desert, and not in the Land of Goshen.

(*To be continued.*)

* It so happens that the valley in which the British troops are now encamped between Ismailiah and Zagazig is the precise scene of our present inquiry; and it was on Tel-el-Maskhuta, described by *The Times* correspondent as "a remarkable mound of considerable height and great size," that Sir Garnet Wolseley planted his small battery during the engagement of August 24 (See *The Times*, August 25). Tel-el-Kebir, where Arabi's forces are entrenched, has, by some Egyptologists, been proposed as the possible site of Pithom; but, as will hereafter be shown, another mound, locally known as Tel Aboo Sooleyman, has more evidence in its favour.—A. B. E.

† See my letter on "The Site of Raamses," *The Academy*, April 24, 1880.

THE SEAT OF WAR IN EGYPT.

By Miss Amelia B. Edwards.

IN a letter to the *Times*, Miss Edwards remarks on the biblical and archæological interest which attaches to the valley through which the British forces are now fighting their way from Ismailiah to Zagazig:—

"The Freshwater Canal by which this valley is traversed follows the course, and in some places flows in the actual bed, of a canal constructed by Seti I., second Pharaoh of the XIXth Dynasty; which Canal, starting like the present work from the marsh lands near Bubastis (the modern Zagazig), was carried during the lifetime of Seti as far as the sheet of water now known as Lake Timsah. After his

death, it was continued, probably as far as the Red Sea, by his son and successor, Rameses II. This valley anciently formed part of the Land of Goshen.

"According to De Rougé, Mariette, Lepsius, and the majority of Egyptologists, it was under Rameses II. that the Egyptians made the lives of the children of Israel 'bitter with hard bondage;' and in the opinion of the same high authorities (an opinion based upon evidence which I am at this present time examining in the columns of a contemporary publication)* the mound of Maskhuta, or Mahuta—the same 'remarkable mound of considerable height and great size' upon which your war correspondent tells us in his despatch of the 24th inst. that 'our feeble battery was placed' marks the site of the city of 'Raamses,' for the building of which the Hebrews were compelled to make bricks with stubble of their own gathering. These bricks, moulded of sun-dried clay mixed with chopped straw, and stamped, some with the cartouche of Rameses II., and some with the cartouche of his successor Menephtah, the Pharaoh of the Exodus, are to be found in any number in and about the mound.

"Two neighbouring mounds are claimed as the site of Pithom, the other 'treasure-city' of the Bible:—1. Tel-el-Kebir, where there is a village and station on the line, and whence, according to Sir G. Wolseley's official telegram in the *Times* of Saturday, August 26, the rebel army was reinforced by railway on the 24th inst.; 2. Tel-Abu-Sooleyman, a mound lying somewhat south of the mouth of the valley, in the direction of Belbeïs.

Tel-el-Maskhuta is situate within a few hundred yards of the station marked 'Rameses.'"

SCIENCE IN ITS APPLICATION TO DOMESTIC LIFE.

By Percy Russell.

THE adaptation of scientific discovery, in all its multifarious results, to the ordinary routine wants of humanity, must surely rank among the greatest practical triumphs of the age. It is not so very long since science—and, indeed, most matters to which the phrase technical could be rightly applied—were purely esoteric, and the mass of mankind was expected rather to express admiration for, than to participate in, the work of the foremost *savants* of the day. It has been aptly observed of Plato, for example, that, like Acestes, in Virgil, he aimed at the stars, but struck nothing; while Bacon, the father of experimental and practical philosophy, fixed his eye on a mark within the human range, and hit it in the centre. In a word, the former began and ended in mere metaphysics; but the latter, commencing in accurate observation, closed in a variety of arts, all of which have benefited mankind materially.

The second annual Exhibition of Domestic Labour-saving Appliances and Articles designed for the promotion of household thrift, opened at the Agricultural Hall, London, on Aug. 24, is in many ways a practical and highly suggestive commentary on the above view of the new relations, comparatively speaking, of science and normal contemporary life. Here we have palpably before us the tangible results of much patient philosophical thought, of profound chemical research, and especially of the higher mathematics whose practical use is so little understood by the majority. The season—and it had endured for centuries—of exclusiveness in science has finally vanished, and its greatest expositors now no longer deem it beneath their dignity to adapt the best results of even their profoundest inquiries to the abridgment of human labour, the prevention of disease, the multiplication of even mere material comforts, and, indeed, to very much that, some generations ago, was generally deemed beneath the dignity, and even outside the proper province, of our principal philosophers. One important outcome of this vast change has been to give a breadth to scientific inquiry which was often wanting before, and to infuse into it an accuracy which was sometimes absent when speculation took a merely metaphysical form. If, observes an able writer, a mathematician made a blunder in defining the properties of eight circles on a sphere, the world was none the worse, but if he made a mistake in estimating the centrifugal force in a wheel, he might indirectly wreck a factory.

The Domestic Exhibition comprehends, indeed, a variety of appliances and contrivances, many of which are founded on the most exact scientific principles, related to such homely, but, rightly viewed, all-important subjects as lighting, warming, and ventilating buildings, the more effective and wholesome preparation and cooking of food—a thing of equal moment to the *savant* and the ignoramus—the labours of the laundry, sundry purely hygienic matters, and, finally, to that admirable, healthy, and refining recreative utility—if the phrase may be used—gardening.

It will be readily perceived from this slight sketch that the various exhibits cover a very wide range indeed, and include much that is really of the highest importance to the material well-being of our household life, both in its outdoor and indoor aspects. In regard to the ventilation of buildings—a matter of the most vital consequence—I noticed an admirable self-acting air-pump ventilator, which is automatic in its working, and can be applied with equal facility to all kinds of buildings, great or small, and is, moreover, capable of being harmoniously blended with any style of architecture. This ventilator is constructed on accurate scientific lines, and ought to be carefully studied by all interested in the subject of ventilation. We noticed, *inter alia*, a very effective gas-engine, which has much to commend it where moderate motive-power is a desideratum. The engine is simple, safe, and economic. It occupies very little space, and may be placed in the upper storey of an ordinary house. There is no danger whatever of explosion, and as a substitute for manual power it is undoubtedly of comprehensive utility.

Another noteworthy labour-saver is that known as Griscom's electro-motor and automatic battery for sewing-machines, &c. The force required is obtained from a box of bichromate cells, and can, it is claimed, be regulated at the will of the operator.

There were also good examples of arrangements for warming buildings of all sizes; and, as might be expected, some excellent things in the way of gas-cooking stoves. The advantages of gas for cooking are certainly great, and the adaptation of some of the stoves shown to the purposes in view is in every way admirable.

The sanitary importance of pure water is now popularly appreciated, and it is generally understood that very much disease and premature death may be traced directly to the use of impure water. The battle of the filters is, therefore, a subject in which we are all of us interested, and I was certainly struck by a contrivance known as the "Filtre Rapide," which bids fair to come out of the competition a victorious champion. It is said to combine all the advantages, and to be destitute of all the disadvantages, of the best filter extant, while it has some valuable merits special to itself. These are great claims, but they appear justified by the facts. For one thing, the water during filtration is aërated thoroughly, while the filter can

* *i.e.* Knowledge.

be taken to pieces and properly cleaned at home by any person—an obvious advantage over some kinds in use.

With regard to constructional matters in respect to domestic architecture, &c., I saw some examples of improved glazing—in one instance equally applicable to curved as to straight rafters; an excellent mechanical arrangement for opening fan-lights, sky-lights, &c.—things causing extreme trouble in many houses; and above all, quite a new method of window ventilation, which is very simple, and yet ingenious; by merely lowering the top sash, which is made about a foot higher than the soffitt of the window opening, a free *vertical* current of air is introduced into the apartment between the glass of the top and bottom sashes, and yet to all appearance the windows are closed. Besides this the sashes are made to turn on centres and incline at any angle, and thus they can be cleaned from the inside only—a matter of no small importance. There are some other special advantages belonging to this invention, known as the Patent Imperial Window, which, by-the-way, has already obtained two prize medals.

Economy in gas was not overlooked by exhibitors, as I observed a very good example of a burner regulator in action; some sectional hot-water coils, patent boilers, a portable heating apparatus, and several efficient hydraulic rams, self-acting, for raising water, were also among the features of the show.

Washing machines and laundry appliances in general were well represented, as were sewing-machines of many types, and other like matters, specially applicable to the ladies' section of the household.

Gardening requisites were in considerable force. I noticed some really striking exhibits in the way of wire arches, fencing, elegant trellis-work, garden furniture, and requisites of all kinds; aviaries, poultry-runs, and the like. Some of the designs in wire-work are really artistic, and these exhibits are equally useful and beautiful in the majority of cases. A very useful and truly economic appliance shown is a patent irrigator, which is well adapted for gardens of all sizes. Possessing, as it does, a horizontal and, at the same time, a revolving action, it can be furnished with such a variety of jets that natural rain may be simulated, from a mere mist to a heavy downpour. As a virtually self-acting apparatus, this irrigator is worthy the consideration of all who have gardens of any size.

Passing from outdoor to indoor requirements, a word must be said in praise of the Remington type-writer, exhibited with an obvious improvement, inasmuch as lower-case letters are now added, and thus it is no longer necessary to use exclusively capital letters. Some space is gained, and the appearance of the work produced is greatly enhanced. The merits of the type-writer are too well known to need further mention.

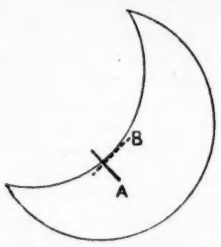
Viewed as a whole, this, the second exhibition of the kind, is a striking fact-testimony to the benign efforts now generally made by our leading scientific men for the material amelioration of the ills and discomforts of human life, and for aiding in many practicable and truly beneficent ways the great causes of hygienic progress and domestic economy in their very widest sense.

HAS THE MOON AN ATMOSPHERE?

By Mr. Ranyard.

(*Continued from page* 215).

ALTHOUGH Prof. Young had failed to find any trace of absorption caused by a lunar atmosphere, M. Thollon determined to repeat the observation. There were at Sohag two large bisulphide of carbon spectroscopes, one belonging to M. Trépied, the Director of the Observatory at Algiers, which had been made upon the model of M. Thollon's spectroscope, and the other M. Thollon's own instrument. The form of these spectroscopes does not permit the observer easily to turn the slit round. It was agreed, therefore, that they should be mounted so that the slit of one of them would be radial while the other was tangential at the part of the moon's limb where the last portion of the solar light would be visible. M. Trépied's slit was placed radially in the position marked by the thick line A



in the figure, while M. Thollon's slit was placed tangentially in the position indicated by the dotted line B. Their instruments were erected within a few feet of one another, in a building constructed of reeds and wood, some ten yards to the south of my tent observatory. It was arranged that during the partial phases of the eclipse I should visit their enclosure and observe with their instruments the spectrum close to the lunar limb. I cannot do better than give a translation of M. Thollon's account of his observation. It is taken from his report, which was presented to the French Academy, and is published in the "*Comptes Rendus*" for the 19th of June, 1882, page 1,633. He says:—

"My great apparatus performed marvellously, and had never given me more beautiful images. I passed in review with scrupulous attention all the telluric region of the spectrum, commencing at the red end. Between A and B I could not perceive any notable change. Arrived at B, I was quite surprised to see a decided reinforcement of the rays which compose this group. I hesitated to communicate this observation to M. Trépied, for fear of disturbing him, when he announced to me that he saw this reinforcement of the group B in a striking manner. It was of the highest importance to verify this fact; so, after some seconds of repose, I applied to it all the force of my attention. All the contour of the moon which was projected upon the sun was successively brought upon the slit, and, strange and inexplicable as it is to me, I did not succeed in reobserving the reinforcement as it had appeared to me in the first instance, nor even to see it in a manner I could be quite sure about. Mr. Ranyard and M. Puiseux, on being referred to, saw the phenomenon with the same certainty as M. Trépied in his apparatus, and with the same uncertainty as myself in mine. This difference was caused perhaps by the difference of the orientations. The slit of the spectroscope of M. Trépied being parallel to the line of centres, cut the limb of the moon perpendicularly, while my slit met the limb tangentially, or in a very oblique manner."

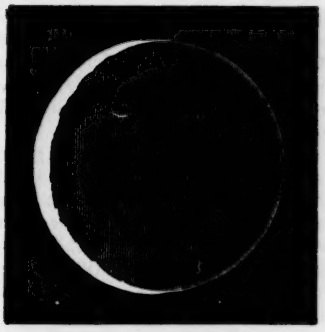
M. Trépied, in his report of observations of the eclipse published in the "*Comptes Rendus*," p. 1,639, says:—"I commenced in the red region; arrived at the B group, I observed a reinforcement of the dark lines close to the lunar limb. The group B, as one can see it in this instrument, is made up of a group of sixteen sharp lines, and

then on the side towards A, of a series of double lines very regularly spaced. In this second part of the group it is always the least refrangible of the two rays which is the darkest; and it was the least refrangible ray of the pairs which was the most affected at the moon's limb. I tried to estimate to what distance from the limb of the moon the reinforcement extended. The part of each line which was darkened appeared to me to correspond to about 1-40th of the height of the spectrum. Since the length of the slit is 7 millimètres, and corresponds to an eighth part of the diameter of the solar image, it is easy to conclude that the absorbing layer, if it exists, which is capable of producing the observed reinforcement, does not extend to a height above 5″ above the moon's limb. The phenomenon was much less visible in the apparatus of M. Thollon, as Mr. Ranyard and M. André Puiseux bore witness. On the hypothesis that there is an absorbing layer about the moon, this difference of effect may be easily explained by the difference of the orientations; it will even be a necessary consequence. I ought to add that even in my apparatus the increase of intensity of the lines was incomparably more feeble during the last phases of the eclipse—very doubtful for Mr. Ranyard and nothing for MM. Thollon and André Puiseux."

I have given these observations at length, so that your readers may judge of the comparative certainty with which the observers principally concerned speak of the evidence they obtained as to the existence of absorption in the lunar atmosphere. My own examination of the spectrum before totality was very short, and in order to speak with certainty, I should have been glad of an opportunity of further examining the adjustments of M. Trépied's instrument. I can only speak with certainty as to the non-existence of absorption after totality when I examined the spectrum at greater leisure. Before totality, I did not notice the difference in the thickness of the double lines of the B group, though M. Trépied called my attention to the matter while I was looking through his instrument, and said that he had noticed such a difference. All the lines seemed to me to be slightly intensified near to the edge of the spectrum, where they were sharply cut off by the moon's limb.

I did not at the time make an estimate of the distance from the edge of the spectrum to which the slight thickening of the lines I thought I could detect extended, but the phenomena I observed (which may have been a mere physiological effect of contrast, or may have been due to a want of accurate focussing of the image of the solar crescent on the slit), extended to a distance of certainly more than 1-40th of the breadth of the spectrum. The next day, on talking the matter over, I thought that it must have extended to at least 1-10th of the breadth of the spectrum. A height of 5″ to which the darkening of the lines observed by M. Trépied extended would correspond to a height of nearly six miles above the moon's limb. In the terrestrial atmosphere absorption increases very rapidly as we approach the earth, and making all allowance for the difference between terrestrial and lunar gravity, it seems difficult to believe that phenomena of absorption could be traced to a height of twenty-four miles above the lunar limb.

It is quite possible that there might be a difference in the condition of the lunar atmosphere at the two limbs, for the limb of the moon which was examined before totality had just been exposed to the intense heat of the sun for a fortnight, while the limb which was seen upon the sun's disc after totality had been cooling during the long lunar night, and it is possible that absorbing vapours might arise under the solar heat which would again be deposited during the lunar night. Fortunately, it will not be necessary to wait for another total eclipse to repeat the observation. A partial solar eclipse is all that is required, and large spectroscopes in all parts of the world from which such an eclipse is visible may be simultaneously directed to the lunar limb.



In connection with this observation, I should like to direct the attention of naked-eye observers to the line of faint illumination which, at the time of new moon, is visible along the outer edge of the dark moon; that is, along the limb which has recently been exposed to the solar rays. Is this line of faint illumination due to dispersion of the sun's rays within an atmosphere which has been raised by the sun's heat? I think that it is pretty certain that the phenomenon is not due to an effect of contrast between the *lumière cendré* on the body of the dark moon and the background of sky; for I have held a circular diaphragm at a distance from the eye, so as just to exclude the light of the sky, and the band of faint illumination along the moon's limb was still visible; and my old friend, Mr. Webb, of Hardwick, has kindly repeated this observation for me, and confirms me as to the objective character of the phenomenon. It is difficult to see why, if the light is due to earthshine, the limb of the moon should be the brightest part. Such a band might possibly be caused by a phosphorescent light from the lunar surface, which slowly dies away as the lunar night advances. But if this were the case, there should not be a similar band of brightness seen along the dark limb of the morning moon, which has been in darkness for half a lunation. I should be glad to learn whether other observers see the band extending with equal brightness along the whole limb, or does it seem to them to be decidedly brighter in the region of the lunar equator? And do they see a similar band of brightness along the limb of the morning moon?

SCIENCE IN CANADA.

By the Editor.

A PROPOSAL has been made that a meeting of the British Association should be held in Canada, and in fact it has been decided, at least for awhile, that the meeting of 1884 should be held at Montreal. For my own part, I think the decision a mistake, and rather a serious one. Apart from objections raised with good reason by members of the British Association, the American Association for the Advancement of Science, which has much more life in it than the British, has been held this year at Montreal; and I rather imagine that if the British Association should meet there two years hence, there would be some degree of disappointment. I know what American tastes are in matters scientific, how much they prefer fresh to dried

food in science, and I know that the kind of food purveyed, for example, at Southampton this year, would emphatically *not* suit American tastes, whether in the United States or in Canada.

But the *Times*, in an article which even in this silly season stands out conspicuous for combined silliness and insolence, finds a "more excellent" reason for disapproving the selection. This is what the *Times* (or some one who, having for the time the run of Jupiter's house, has found and put on an inappropriate lion-skin) tells us about Canadian science :—

"Canada is great in extent, but not great in science. Humbler scientific views and less advanced thoughts than the British Association will bring with it would serve her as well for any instruction she will derive from them. Our scientific men must be well aware of this. They can have no serious purpose of holding a scientific meeting in Canada. Their wish must be to have an agreeable outing, to be looked up to with blank wonderment, to be pointed out wherever they go as the men who have done something or other which no other human beings have succeeded in doing, the magicians of the modern world, men skilful in strange, out-of-the-way arts. Their acquirements and their performances will be alike taken on faith. If they talk sense, they will be listened to. If they talk nonsense, they will be listened to all the same, and with the same degree of intelligent appreciation. We must not be surprised that our scientific men like the pose and the surroundings. They are mortal beings, of the same passions as the rest, and capable of being attracted in the same way as the rest. We do not at all grudge them the glory and the pleasure in store for them on their Canadian visit. Our only regret is that the gain of Canada will be our loss, and that in 1884, if the present design is carried out, we shall be deprived of the scientific lessons which the Association has given us during the last half-century. The invitation to Canada ought not, we think, to be accepted. A meeting of the Association in Canada can be in no sense the same thing as a meeting on English ground would be. But that the invitation should have been given, and should have been pressed, and that the way for its acceptance should have been as smooth as it could be, are very welcome signs of Canadian good feeling to the mother country. The wish of our colonists is that they should not be considered strangers to us. Their country is to be a part of our country. We are to be at home on their soil. The British Association is to be the common property of Great Britain and of Greater Britain. We are glad to be on these terms with Canada and with our other colonies. They are our rivals already in some things more congenial to their habits of life than scientific pursuits are. They have met us as oarsmen, and have beaten us so completely as to make us a little ashamed of ourselves. Special rules have had to be invented, in the interest of our pot-hunters, to prevent them from carrying away too many prizes at our regattas. In cricket we can hold our own, but even in cricket Australia runs us close." There is much more of this, but *quorsum hæc tam putida tendunt?* "Australian cricket has been a somewhat new revelation to us. We knew that they played cricket in Australia, but until they came over to this country and gave us proof what they could do, we had no notion that they played it so exceedingly well. Contests of this kind, on the river, or on the cricket-field, or with the rifle, are healthy in every way. If they go against us, we must accept our fate with the best grace we can, and must take comfort in the thought that we have been beaten by men of our own race and blood. But when the challenge is transferred to other ground, when we are asked to send our best scientific representatives to Canada, we may fairly ask for some proof that Canada is deserving of the compliment. Her hospitable intentions are beyond all doubt, but if her hospitality is accepted, it must be accepted on its own account, and not with any added notion that Canada is a fit place for a scientific gathering. We shall be sorry if the British Association is tempted away from its home duties for the sake of a run in Canada. With the movements of its members as individuals we have nothing to do, and surely Canada might be content to receive them as individuals, without insisting that they shall come as an associated host, and under a corporate name which has not been of their own creation, and which is not at their own disposal, but is common English property."

NEW VIEWS ON CRICKET.

SPEAKING of the cricket changes recently suggested in these columns, "A Lover of Cricket" makes the following remarks in the *Times* for September 1st :—"The suggested change is simply that while, as now, wicket after wicket should fall on either side till the tenth and last was taken, the fall of separate wickets should alternate between the two elevens, instead of the fall of all on one side alternating with the fall of all on the other. Thus, call the two sides A and B. Say side A, having won the toss, go to the wickets, the ground suiting them. After a while they lose a wicket ; then side B go in, on ground very little changed, till, in turn, they lose a wicket. Side A go again to the wicket, sending in a man to replace the one whose wicket has fallen, precisely as in the game as usually played. After another wicket lost on side A, side B do likewise. And thus the sides alternate, wicket after wicket falling on either side, till the first innings is completed, the record of the innings appearing in precisely the same form as at present. Then a second innings is commenced, and, if possible, played out in the same way ; if time does not allow this, the game is decided by the score when B's last wicket fell, at which time, of course, sides A and B have lost an equal number of wickets. If, on the other hand, the second innings is completed long before time is up (some time limit, as an hour or two hours, might be named in the laws), sides A and B would continue to send in man after man as before, till time expired.

"To illustrate this method, take the recent match between the Australians and England from the end of the first innings. The Australians, then in a minority of 38, would have sent in Massie and Bannerman, who (playing as they actually did) would have knocked off the deficiency and put 28 runs to the good before Massie's wicket fell. Then England would have sent in Hornby and Grace, who would have only knocked off 15 of the 28 before Hornby's wicket fell ; so that when the Australians went in, with Bannerman and Bonnor, they would have been 13 to the good, increased to 17, when Bonnor's middle stump was knocked out of the ground. The loss of Barlow's wicket would have left England still 17 behind ; and the loss of Bannerman's on the other side would have left the balance unchanged. Then Grace and Ulyett putting on 36 would have put England ahead by 19 runs. And so the game would have gone on with alternating positions (most interesting to spectators), till the end of the second innings, with England seven in arrears. But that would not have been the end of the game. All the remaining time on Tuesday and on Wednesday would have been occupied with a most interesting contest between the two elevens.

"It is claimed—and with obvious justice—for this method

that, if it were followed, no game would ever end in a draw, none would fail to fill the whole time assigned to it, and in none would either side have any undue advantage from the state of the ground or weather. It may be added that matches played on this plan would be intensely interesting, and that neither side would be kept (as now often happens) waiting idly during a day, or even two days, of a long innings. But the three great advantages first named are such as to dwarf all others, and, I conceive, to make such few disadvantages as the system (properly arranged) might involve altogether as nothing by comparison.

"The system is worth trying. Once tried, I believe it would quickly replace the imperfect system at present in vogue, which in four cases out of five leads to most unsatisfactory results."

THE USE OF OPIUM.

AT the quarterly general meeting of the British Medical Temperance Association, held recently in the rooms of the Medical Society of London, 11, Chandos-street, Cavendish-square, a paper was read by Dr. G. Shearer, of Liverpool, on "Recent Apologists for the Opium Trade." Dr. Norman Kerr presided. The attendance was small. The most powerful apologist, in his opinion, Dr. Shearer remarked, was the present Prime Minister. In 1870, during a debate in the House of Commons, in reply to Sir W. Lawson, Mr. Gladstone said, "I affirm that if we are to denounce the use of opium as something which is universally, essentially, and irretrievably bad, that must be done after it has been proved that the use of opium is to be broadly distinguished from the use of every other stimulant—a point which is not settled yet." But, argued Dr. Shearer, though there is a distinction to be drawn between opium and alcohol, and the common use of the former might vastly exceed in its baneful effects the common use of the latter, which there was an overwhelming weight of testimony to prove, still for the purpose of justice and fair dealing towards an injured people this was unnecessary. There was a preponderating weight of testimony as to the destructiveness of the vice. Among the Chinese people no advocates for the practice could be found; the nature of the commercial treaties between the Japanese and the Coreans and other nations, which were absolutely prohibitive of the trade in opium, and the action of the Indian Government in putting down the retail sale of the drug in Burmah, went as far in proof of the unmixed mischief caused by the use of opium, he should think, as Mr. Gladstone could desire. Against the views of Sir George Birdwood, Deputy Surgeon-General Moore, and Dr. Ayres, he set the evidence of many medical men, beginning with Dr. Kane, who had seen the results of the custom in his practice in the United States. Dr. Kane wrote that, "Viewed from any standpoint, the practice is filthy and disgusting; is a reef that is bound to sink morality; is a curse to the parent, the family, and the Government; is a fertile cause of crime, lying, insanity, debt, and suicide; is a poison to hope and ambition; a sunderer of family ties; a breeder of sensuality; a destroyer of bodily and mental function; and a thing to be viewed with abhorrence by every honest man and virtuous woman." The late Dr. Reid, of Hankow, stated that "Opium differed from alcoholic indulgence by the absolute necessity of having a daily quantity. A drunkard may abstain until means accumulate to enable him to purchase liquor, and may do his work efficiently in the intervals; but the opium-smoker must have his daily stimulant, or he breaks down." Dr. Myers, of Takow, Formosa, thought opium-smokers might be divided into two classes—first a minority who, being either officials or well-to-do persons, could afford to give vent to their passion and indulge to an extent which would in many cases justify the worst that had been said as to the effects and consequences of the vice; and, secondly, the majority, consisting of persons who were obliged to work hard for a living, and among whom moderation was the rule. Even among the former class there were some who had a remarkable power of self-regulation, taking just so much as they knew would abate the craving and remove the state of exhaustion, languor, and misery consequent on previous indulgence, and stopping short of all unmanageable or incapacitating indulgence. There was no doubt that many in this class retained sufficient self-control to continue the practice consistently with the discharge of their official duties or business, and with a fair measure of health and strength for many years. The tolerance of poisons by the human constitution was one of the most singular and least investigated of the processes of life. Having quoted the testimony of several observers, medical and official, as to the effects of opium-taking, Dr. Shearer spoke from his own experience, gained during a residence of over six years in China, which had led him to the conclusion that the Chinese did not enjoy even comparative immunity from consumption and diseases of the respiratory organs; that while the drug might be of value during the paroxysms of febrile disorders, it was not a prophylactic against fever, and that, considered merely as a stimulant and substitute for food, its usefulness had been overrated. The truth was, that many used the drug with apparent impunity for many years, and that many, but much the smaller number, were very seriously injured by the practice. Dr. C. R. Drysdale moved, and Dr. J. J. Ridge seconded the following resolution, which, after discussion, was unanimously adopted:—"That this meeting, having considered the evidence for and against the use of opium, condemns it as most injurious to health and happiness."

BUTTERFLIES AND MOTHS.

By W. J. H. CLARKE.

THE PROMINENT MOTHS (*continued*).

IN our last paper we gave a short sketch of the first six Prominent Moths, and this week we purpose finishing that family by giving descriptions of the remainder.

The last mentioned was the White Prominent (*Notodonta bicolor*), and next upon our list we find the Swallow Prominent (*Notodonta dictæa*). This is a very handsome species, the fore wings being of a greyish-brown tint in the centre, with the front edge darker, and a large purple-brown spot near the tip; the inner margin is of a fine brown, which shades off into the lighter colour of the centre. The hind wings are of a very pale hue, with a compound brown blotch at the anal angle; the body and thorax are brown. The caterpillar is green, with the usual yellow stripe down the side; it has also a black line on the twelfth segment. The leaves of the poplar and willow form its food, and the insect in all its stages should be looked for thereabouts.

Very similar to the last, and next in order comes the Lesser Swallow Prominent (*Notodonta dictæoides*). In colour it is precisely similar to *N. dictæa*, with the exception of the white mark on the anal angle of the fore wings, which is linear in *dictæa*, being wedge-shaped and more noticeable. This moth flies in June, and is not very abundant. The caterpillar is, we believe, green, with a yellow stripe similar to the last, but we have never had the good luck to capture one. It feeds on the birch.

The Iron Prominent (*Notodonta dromedarius*) next claims our attention. This moth should be sought for during the month of June, and though not common, it is to be found generally throughout the Midland and Southern counties of England. In colour the fore wings of this species are dull purplish brown, with a buff patch at the base of the front margin; the hind wings are greyish-brown. The caterpillar appears in August, and feeds on the birch and alder; it is yellowish green in colour, with a dull purple stripe down the back from the second to the fourth segments, and the remaining portion of the body is covered with small humps.

Next on our list of Prominents comes the Three-Humped Prominent (*Notodonta trilophus*). This very rare species is on the wing in May and August; the fore wings are dull yellowish brown, with two brown streaks, between which is a dull spot; the hind wings are white. The caterpillar may be sought for on the aspen, poplar, and birch during the month of July. It is dark-green in colour, with humps on several of the segments, and a reddish streak down the back, from the head to the fifth segment; along the spiracles is a broken, reddish streak.

The next species coming under notice is the Pebble Prominent (*Notodonta ziczac*). This, the commonest of the British Prominents, is one of the most handsome, and in the caterpillar state the most singular. The colour of the wings is yellowish brown, with a slight reddish tinge towards the upper margin; beyond the middle there is a large oval patch of purple and brown. The caterpillar is of a greyish colour, with three pale stripes on the sides, and is covered with humps in every direction; it feeds on the poplar, and is to be found towards the end of June, and in September and October. The perfect insect flies in May.

The last species of all is the Great Prominent (*Notodonta trepida*). It is the finest of its tribe, sometimes attaining the great size of two-and-a-half inches across the wings. The whole surface of the wings has a beautiful marbled appearance, the colour being smoky brown, with two streaks of a darker brown before the middle, and some brown spots on the hind margin. The perfect insect appears in May and June, and is rather rare. The caterpillar feeds upon

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the oak, and is green, with two white lines down the back, and an oblique red stripe, edged with yellow on the side of each segment. It should be sought for from July to September.

In the foregoing notes we have endeavoured to point out the principal characteristics of each species of this interesting family of moths, as few entomologists appear to have taken as much notice of them as their beautiful structure deserves, and we should advise all collectors to more thoroughly examine tree-trunks and under fallen leaves during this and the next month, as many of the rarer Prominents might become more known by these means.

Our Paradox Corner.

PROFESSOR SCHWEDOFF'S THEORY OF HAIL.

THE British Association supplies this year, and not for the first time, a full-grown paradox, which students of science, who should have known better, have been ready to support.

In Section A, on Monday, Aug. 28, Prof. Sylvanus Thompson blandly occupied nearly an hour of the meeting's time with a most monstrous theory as to the origin of hail—a theory advanced originally by Prof. Schwedoff, but adopted, or at least supported, by Prof. Thompson, despite its manifest absurdity. After describing some very large hailstones, including one (whose description was received by the meeting with irreverent laughter) as large as an elephant, and three days a-melting, Prof. Schwedoff contended in this paper that hail is not of atmospheric origin, generated from moisture suddenly in aerial storms, but comes from ultra-terrestrial regions. In short, hailstones, according to this portentous theory, are meteors of cosmic origin.

Of course, with interplanetary space occupied, according to Dr. Siemens' ingenious paradox, by aqueous vapour, nothing would be more natural than the formation of crystalline masses of water in extra-terrestrial space. These, wherever found, would be drawn sunwards, one would suppose; and the only way in which they could encounter the earth would be when they were formed outside the earth. Then, if they were drawn towards the sun when it was in the way, they would fall on that side of the earth which was furthest from the sun—that is, where night was in progress. If hail always fell in the night, this would be a very ingenious theory by the way; only, as a matter of fact, hail falls oftener in the daytime.

Sir W. Thomson at once rose to his feet, when his almost namesake had concluded, and asked whether this meteoric theory of the origin of hail was put forward as a joke? He showed that meteoric hail falling through the atmosphere with planetary velocity would perform 13,000 times as much work as would raise water one degree centigrade, which—he rather thought—would melt the hailstones. Here occurred one of those little scenes which occasionally lighten the dreary work of scientific talk-fights (the most utterly time-wasting occupation I know of). Lord Rayleigh slyly said he had heard of another meteoric theory, which some said was advanced in jest quite as much as Schwedoff's—the theory that meteors, fragments of a burst planet, may have brought the germs of life to this earth. ("The Kettle to the Pot objects," he seemed to hint, "its sordid superficies.") But Sir W. Thomson repudiated the suggestion of jest in his notorious germ theory. He did not himself think, he said, that life as it now exists on this earth had sprung from meteoric visitants, fragments of a planet which had burst millions of years before; but he maintained that it could not be proved to be impossible that some forms of life might thus be brought to a planet (wherefore Sir W. Thomson must have been very imperfectly reported at Edinburgh). Neither can it be absolutely proved to be impossible that the moon is made of green cheese. If we assign to the meteoric germ theory the same standing that we give to the theory of the verdant caseity of the moon, science will not be much the worse for either. Professor Schwedoff's theory stands on about the same footing. It is utterly unlikely that ice-masses exist in interplanetary space; still more utterly utter is the improbability that such masses could reach the earth unmelted. If they did reach the earth, they would not show, as hailstorms do, a preference for some regions and an utter dislike for others (Peru, for example). Still, the theory is not more inconceivably improbable than Sir W. Thomson's germ theory, or than the theory I formed myself, "in the days of my" scientific "youth," that the moon's whiteness (she being really more nearly black than white) is due to snow on her plains, and slopes, and mountain sides.

Letters to the Editor.

[The Editor does not hold himself responsible for the opinions of his correspondents. He cannot undertake to return manuscripts or to correspond with their writers. All communications should be as short as possible, consistently with full and clear statements of the writer's meaning.]

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"In knowledge, that man only is to be contemned and despised who is not in a state of transition. . . . . Nor is there anything more adverse to accuracy than fixity of opinion."—*Faraday.*

"Show me a man who makes no mistakes, and I will show you a man who has done nothing."—*Liebig.*

ALCOHOL AND BRAIN WORK.

[536]—I think I can recognise the "learned friend" of whom you speak in your answer to the fiery denouncer of "fire-water," and perhaps a little more detailed information may be of use to you and others, from one who is as near as can be to a teetotaller from infancy, and yet may be said to be infinitely different from one, as the smallest known quantity is infinitely more than nothing. I am utterly indifferent to philosophy, whether alcohol is "poison," as milk is in excess, or "food," as castor oil is partially, or a constituent of the brain, as phosphorus is, or whatever anybody may choose to say that it is or is not.

I was four years at Cambridge, beginning nearly fifty years ago—a far more bibulous time than now—without ever drinking a glass of anything stronger than the college "swipes" given us at dinner, and occasionally a glass of the much better ale at a party, having been reared without even that, and disliking wine and spirits still more to this day. And I did much the same after I came to London, until I gave up even that small quantity of alcoholic drink—I forget for what reason; and I thought I did as well without it. But soon after I got into large practice at the Bar (without a scrap of notice, which I thought very unfair and unusual on the part of Nature), I became unable to sleep, often for several nights together, and never well except after some very bad nights. I guessed at the cause, and turned on my beer again, and gradually mended, but not completely for five years. After that I turned my beer into a daily half-pint of cider (in what the British merchant, the type of honesty all over the world, calls a pint bottle, with a false bottom which seems annually to increase), because I found beer tended to rheumatism and some kidney ailments, of which last, cider is a well-known preventive—at least to doctors in the cider counties, though to very few elsewhere, it seems.

That is my experience as a man working with my brains. My earlier experience as a worker with legs and hands was that alcohol is of no use whatever, and that seems to have been proved over and over again. I must add that I have known one man of considerable age able to go on doing hard work with his head on teetotalism, though I have known sundry, like myself, think they were doing very well on it for a time, and I have heard of a few others. Of course, that proves that some may while others cannot, and it may be worth everybody's while to try the experiment; but they had better watch it carefully, for fear Nature should play them the same trick as she did me, and come down upon them without notice. The cleverest doctor I ever knew, now dead, though the manager of a water-cure establishment, used to tell me the same, and particularly that he had annually to cure with a little disguised alcohol the leader of some teetotal society who used to come there annually for "water-cure," as he supposed.

Your "Learned Friend."

ALCOHOL AS A FOOD.

[537]—I have never in my life (not even when young and merry) known what it is to be intoxicated. I cannot find words to describe adequately the feelings of disgust, shame, and pity that a drunken man inspires me with. I dislike, and do not often visit, public places, but when for the sake of friendship I have to do so, the conventional small measure (one-eighth of a pint) of spirits dis-

comfits me very much, and it becomes a struggle for mastery (between myself and the unholy spirit). Yet I most emphatically declare that I consider alcohol a necessary "food" for me, "under the conditions in which I have to work and live."

These conditions are, "more or less," shared by many thousands of my fellow-creatures, from the artisan, trade professional, and literary classes, and differ very widely from the primæval condition of man described by Mr. W. Mattieu Williams in his letter (No. 514, p. 201). In such a condition, "all stimulants are unnecessary, and what is unnecessary must be injurious."

But even when man does not entirely spend his time in exhilarating pedestrian exercise, nor always breathe fresh mountain air and drink from the refreshing stream, he can (if he likes) dispense with stimulants, provided, first, he has the means, and secondly, the leisure, to secure for himself bodily comfort, fresh air, and exercise. These will supply the waste of energy by man's daily avocations in a far better manner than stimulants will do. But when man lives in what I may call the third condition (and which is my lot), then I say alcohol cannot be dispensed with.

My work is purely mental and literary. Of this I have about twelve hours daily. My meals occupy me about two hours, travelling to and fro about two hours, and I have eight hour's sleep, making in all the twenty-four hours of the day. I have two holidays in the year (Good Friday and Christmas Day). I am acquainted with the seaside from picture-galleries; and with country rambles on bicycle or tricycle only from Mr. Browning's interesting articles in KNOWLEDGE.

To come to the point, I believe from my own experience stimulants have an injurious effect upon mental work. I dare not take the smallest quantity of it, in the middle of the day, without feeling hazy and giddy, and less able to see things clearly. But now I come to my chief assertion: "I take alcohol to overcome the fatigue of the body, caused by the labour of the mind, after the brain has done its daily work."

I draw particular attention that I used the term food for alcohol, and I maintain, in spite of a whole faculty, that there is a line below which alcohol (especially in its most natural combination, such as pure wine) is an ordinary food, above that line it is a stimulant, and above that "a poison."

I can neither afford to pay for, nor do I believe in the existence of, pure wines in this country. I therefore prefer good brandy, as being most agreeable and wholesome, and I will describe my method of taking it.

At night time, when tired and weary, a little brandy is sometimes necessary to enable me to fall into a good sleep, for after heavy mental work the mind will not easily rest of its own accord. I might therefore take for supper a cup of chocolate or coffee, with "one" (no more is necessary) small teaspoonful of brandy in it. If I take some light nourishment (I do not take heavy suppers), such as stewed fruit, rice, or some other farinaceous preparation, with milk, or milk and one raw egg mixed, then even half a teaspoonful of brandy will not only make these (mostly sweet) preparations agreeable to the palate, but also supply me with the necessary stimulative energy "to bridge over time intervening between cessation of work and the regaining of strength by natural means, such as rest or sleep." If by want of exercise I feel very low (and often bilious), then I do not take any food at all at night, but increase the quantity of brandy to two teaspoonfuls, taken in half a tumbler of soda.

I may also describe the consequences of not taking any brandy when feeling very low and fatigued. These begin about half-an-hour after repairing to bed, and consist in ceaseless energy of the brain, want of sleep, and gradual weakening of the action of the heart, which sometimes results in a distressing struggle for breath. Of course, a medical man would say—take more exercise! work less! go to the seaside! and buy a tricycle! But not being able to fill his behests, I must live (or die) my own way.

Let me finally add that, little as the quantity of alcohol is that I take, I wish it by no means to be inferred that I make a practice of it. I rather try to avoid taking it. When feeling strong enough, and well able to bear my daily task of labour, then sometimes weeks will pass without my taking a single drop of alcohol in any form whatever.

MEPHISTO.

FAIRY RINGS.

"Where witches on kail runts did prance,
And whirling, led the merry dance."

[538]—I offer you a little contribution on the "Fairy Ring" puzzle, and trust that it may be suitable for the pages of KNOWLEDGE.

When a lad of ten years, I had occasion frequently to wander over a large old-land pasture field belonging to my father. It contained about 180 acres, and was sixty or seventy years' old grass, but had never been cut for hay. For forty-seven years I have kept up an intimate acquaintance with this large park, walking or riding over it almost every week in the year. My attention was very early called to the fairy rings, scattered all over the place. I had neither heard nor read of such rings, and many a time did I stand and wonder what produced them. I watched them from year to year, and saw them gradually widening the circle. Some of them I saw break on one side. The circle opened more and more, until it was shaped just like a D, thus), without the perpendicular stroke. Others I noticed broke up at two or three points of the circle, thus ○, and thus ○. My curiosity was aroused. I gave them more attention, and found some of the finest of the rings in a few years represented thus), and thus), all that remained of them.

About forty years ago (I am not sure to a year or two) we had a warm, damp, mothy summer. That year we had twenty horses grazing in the said park, and in the early autumn every horse-dropping produced a little plot of fungi. "Now," I said to myself, "I'll watch you;" for I had noticed that at a certain season of the year the same fungus grew on all the rings. These are my observations. The little plot of fungus of a foot in diameter of the first year was in the second autumn changed into a ring of three feet in diameter. When the fungus died off in the autumn, the grass springing up on the path of the fungus was dark blue, and what I believe to be a bad grass, as I never saw the stock eat it. On the little plot of a foot in diameter of the first year's fungi, there were no fungi in the second year, and the grass had assumed its natural colour in centre of the ring. The path of the fungus widened outwards, leaving yearly a larger inner circle of grass restored to its usual appearance. Some of these little plots which I knew forty years ago are now 180 feet in circumference. The most of the rings of forty years ago have become broken and scattered, and as good as lost to the ordinary observer. Rings are broken up by coming in contact with the path of contiguous rings, or old rings, or with spots of the land containing no food for fungus, and the remnants of them get into all shapes and sizes; but retain their bluish-green colour so long as any fungus grow. The spores of fungi permeate all soils, and only want proper food to develope them. The ring arises from the original manuring being applied in a circle, and the bed of fungi would take any other shape you wished, by laying on the dung in that shape. The fungi, once vigorously produced, will spread outwards on all sides for many years, but will not grow and thrive on the identical soil, without special manuring a second year. I don't think hay-tea will develope fungi, but I am not certain. The extremity of the tether of donkey, horse, or cow being the parent of a fairy ring is, I think, not a happy conjecture. I fear my letter is too long for KNOWLEDGE. Many thanks to Mr. Mattieu Williams for his fair and candid thoughts on this interesting subject.

DAVID CARR.

[539]—When I was a lad, my father took me to see some very remarkable examples of these rings. They were of all sizes, from a foot in diameter to about fourteen feet; the colour light yellow, owing to the grass composing them having been killed. They were quite circular, and quite sharply-defined on the ground of green grass. The rim or body of these rings measured from two inches in the small ones to nearly a foot in the larger ones. They were all crowded together, and several of them intersected; but even then every part of each was sharply defined, and every one kept its own proper breadth and symmetry. These were the only examples I have come across where the grass composing them was killed. All the others I have seen were composed of grass much greener and of stronger growth than the rest of the lawn on which they appeared; for in every case which has come under my observation these rings appeared *on old, well-kept, frequently-mown lawns, and warm, very sheltered situations.*

To one like myself, who has lived all his days in the country, the idea of the rings, sometimes seen after haycocks have been removed, being mistaken for the true fairy rings, is amusing. It reminds me of a town cousin, who, the first time he saw haycocks, came to the conclusion that they had been put up to frighten the crows.

JAMES PATESSON, Glasgow.

LEARNING TO SWIM.

[540]—After reading your instructions on swimming, I thought you would not object to hear how I taught myself to swim. In the first place, I avoided the handbooks and bath-teachers, with their infernal belts, more than I would poison; in fact, the only thing I did, after watching how fellows swam and dived, was to dive myself. When in the water, I kept under as long as my oxygen lasted, struggling energetically the while in my endeavours to make

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progress under water. On reaching the surface, I kept on with my endeavours.* Some "old boys," who watched my endeavours for the first two days, used to remark that they never remembered any one learning so quickly.

There is, however, a caution to be given to those boys who possess an unenviable amount of animal fat in their compositions; for a fellow-schoolboy, now living, thought he would follow suit, and threw himself boldly into the water. This is what we saw: Two legs hanging down, though not touching the bottom; a head likewise hanging down, also about two feet from solid ground; a pair of bathing drawers alone visible above water. We thought this fine, coupled with the energetic movements of the arms and legs, like a decapitated frog electrified; but one of our boys happily conceived the idea that the kid was drowning, so we hauled him out. Another minute would have ended his life. F. C. S.

VARICOSE VEINS AND CYCLING—ARTISTIC PERCEPTION OF ANIMALS—ACCIDENT FROM LIGHTNING.

[541]—It appears to me that "Lacy Hillier" takes a somewhat erroneous view of this subject. I am not a medical man, but only speak from experience and from the information I have derived from friends; which I may say I have found more useful than that obtained from members of the medical profession. Varicose veins are veins in which the valves, whether double or single, no longer act; the use of elastic stockings therefore being, as it were, to act to a certain degree by expansion and contraction as valves. An exercise which brings all the muscles in the leg into play is therefore obviously the best, provided the exercise is not carried to excess. Standing is the worst possible position, lying down *à priori* the best, riding the worst of the moderate exercises, owing to the action of the saddle on the two chief veins of the thighs. Bicycling I have, and so have all my friends, found the worst of all amusements, except, perhaps, riding, for varicose veins, as the actions of all the muscles of the legs are not brought evenly to bear on the veins. Elastic stockings should always be worn after the veins have once appeared. No amount of absolute rest will cure the veins, for I have tried it. Walking and running are good for the veins; I used to follow the hounds on foot, run trails, paper chases, &c., being out the whole day, and not feel pain in the veins, whereas a day's bicycling left its mark behind. Having ridden a bicycle for over nine years, I was able to form a fair idea as to its influence on my veins. Seeing that there is no cure for the veins, except extermination, accompanied even then with the chances that fresh surface ones will come to light, or others become varicosed under the muscles, which is a more dangerous phase of the disease, I strongly advise any person with *bad* varicosers (as we call them) to leave off riding a bicycle.

With reference to J. G. Westwood Oliver's query at the end of his letter (502), permit me to say that, from experience, I find that it all depends on the cuteness of the cat looking at the mirror; *i.e.*, some see through the fraud at once, others seem to do so and forget it afterwards, while others, again, fail to understand the deception until they have been shown the reflection over and over again.

The following I cite from memory—it occurred some years ago in the North of England, at the rectory of a clergyman. Please, therefore, excuse details:—The house was struck three times in succession. One flash (and it is on account of this I write) actually came *through* the glass of one of the windows, leaving a clean hole in the glass afterwards, which was fused evenly all round. Another flash entered the drawing-room, and I believe ran down the bell-wire and tore up some of the gas-piping in the basement. The damage done to the house was considerable, as may be supposed.

F. C. S.

VARICOSE VEINS AND CYCLING.

[542]—It has been asked if cycling induces varicose veins. My experience is that it has no such effect. In many cases it seems to be rather preventive than otherwise. For men who have been walking or standing much during the day, and whose legs and feet, in consequence, feel heavy, weary, and full, with a tendency to varicosity, a little exercise on a bicycle relieves this condition; whereas it would be aggravated by walking, running, or jumping. Even for those with varicose veins already induced, I believe cycling to be one of the least injurious of all leg exercises, provided that the leg has free play, there being no part of the dress constricting it at any point. A. Hartley, M.B.

[543]—The use of bicycles and tricycles does not cause varicose veins, but the use of garters and kneebreeches buckled, or tightly buttoned round the knees, does cause them. On learning to bicycle, about three years since, I had a narrow escape from having varicose veins, caused by the use of garters and knee-breeches as above. Since then I have always worn knickerbockers just large enough at the knee to allow the foot and leg to pass through (no elastic), and have a loop at the top of the stocking so as to pass a tape through it. The tape is fastened at the end of a piece of elastic, the top end of which is sewn on to the waistband of the knickerbockers. Braces must be worn to counteract the pull of the elastic.

E. F. B. Harston.

* The method is all very well if there are folk by to haul the learner out if necessary. "Natator's" lessons are for self-teaching.

HERNIA AND TRICYCLING.

[544]—I am glad to see a letter in a recent issue of your valuable paper, a letter headed "Hernia and Tricycling." This is a subject I am interested in, as I suffer from that complaint, and am very fond of tricycling. Some of your readers may be glad to know my experience after having ridden some thousands of miles. I started by riding ten miles a day, and since then have increased it to seventy, and do not feel the slightest ill effects; on the contrary, my health is very much improved. I hope Dr. Richardson will still further investigate the matter, as I feel sure many people, suffering like myself, are denying themselves a most delightful and healthy pleasure through want of proper advice, which advice I consider can only be given by those who ride tricycles. Of course, there are some complicated cases of hernia where it would be most dangerous, but in the ordinary cases there can be no harm, providing persons are fitted with suitable trusses.

R. Sept. Alder.

TRICYCLES.

[545]—Having been an enthusiastic tricyclist for the last four years, and being the captain of a tricycle club, perhaps you will kindly allow me to say a few words upon the subject.

Mr. Browning overlooks two very important advantages gained by the front-steering machines.

1. In machines of the "Salvo" type, nearly the whole of the rider's weight is thrown upon the driving-wheels, sufficient weight only being thrown upon the steering-wheel to enable it to "bite." For this reason we have a dead weight on two of the wheels only, while in the case of a rear-steering machine, we always have a dead weight on three wheels, so in this respect the "Salvo" type of machine has an advantage almost equal to that of the "Otto," and, of course, when descending a hill with the feet on the rest, there is sufficient weight on the front steering-wheel to insure its answering its purpose without the fear of an accident.

2. Machines of the "Salvo" type can be so easily mounted from behind while in motion.

I drew attention to this important fact by a letter which appeared in the *Cyclist* some time ago. No time is lost in mounting or starting; the machine is mounted (as in the case of a bicycle) while you are running with it at full speed. The advantages of this are obvious; but they are not offered to us when riding a rear steering machine.

A great deal of the pleasure of tricycle riding is lost when sailing down hill on a machine of the "Meteor" type by the want of a comfortable foot-rest, as in the "Salvo," "Fleet," "Premier," &c., which enables one to stretch their legs for a while.

I think in the tricycle of the future it will not be so much a question of form as of a means for propelling machines by other than our legs as the motive power. Can the day be far distant when compressed air will be the chief mode of propulsion?

C. Carus-Wilson.

A WARNING.

[546]—Being desirous of obtaining the first three numbers of Knowledge, I advertised for the same in your "Sixpenny Sale Column." Among several answers I selected one and forwarded the amount by Post-office Order, but I have not received the papers nor heard anything further from the writer. I fortunately sent an Order payable ten days after date, which I have stopped. On the day I wrote to stop my previous order I received a post-card dating from a Post-office near Manchester. Thinking the writer was probably a clerk in the Post-office, I forwarded the amount, with the result that I have not received any papers or heard anything further about them. Thinking my experience of purchasing Knowledge may be of use to your readers, I venture to send this for insertion.

EXE.

ARE TOADS POISONOUS?

[547]—In reply to this query, I find the following in "Half-Hours in the Green Lanes."—"All that is harmful about this poor beast (*i.e.* the toad) is the secretion of the skin, which is acid, and evidently protective. Many a young and playful puppy, that has

endeavoured to carry a toad in its mouth, has found out the properties of this secretion to its cost, and the foaming at its mouth has plainly indicated its disagreeable nature. . . . . This 'toad's envenom'd juice' has long been known to ancients as well as moderns." W. CARLING, JUN.

VEGETARIANISM AND FITS.

[548]—I have known two cases of epileptic fits cured by Vegetarian diet—one a man over forty, who lived and worked hard till past sixty; the other a young man still living. A vegetable diet is said to produce flatulence; it did the opposite with me—it cured it in about three months. JOHN ALEX. OLLARD, F.R.M.S.

THE CALEDONIANS.

[549]—Mr. Plaisher, in KNOWLEDGE of the 4th inst., asks, very naturally, as it has been so often said by those practically ignorant of the language, if the word Caledonii does not come from *coille-dhaoine*. Certainly not, as the usage of the language forbids it. We say *daoine-sith, daoine-nasal, daoine-Airghaelach*, &c., &c., but *not* the converse, *sith-dhaoine, nasal-dhaoine, Airghaelach-dhaoine*. Such would be placing the cart before the horse, and quite inadmissible. B. S.

STIMULANTS AND WORK.

[550]—I am heartily glad that you commented on the surprising dictum of Mr. W. Mattieu Williams, that the drinking of wine is a folly or a vice. There are many who are in the habit of taking wine every day of their lives, and who are yet neither foolish nor vicious. The man who enjoys a good dinner runs, I think, the same risk of being called foolish or vicious as the man who enjoys a glass of good wine. The folly begins, in my opinion, when a man exceeds and passes beyond moderation, either in eating or drinking. With the principle of total abstinence I disagree, because in its essence the principle is against nature.

ROBERT MACPHERSON, M.D.

ARTISTIC PERCEPTION OF ANIMALS.

[551]—I am not sure I quite understand the meaning of the last paragraph in your correspondent's letter. Does he wish to say that a cat, having seen its reflection in a mirror, becomes at once convinced of the true nature of the phenomenon, and therefore never cares to notice it again?

Having studied the habits of cats—animals in which I take a great interest—for many years, I am in a position to affirm that when a kitten sees itself in a looking-glass for the first time, it evidently imagines it has a stranger before it, and it is only after many experiments, such as touching the surface of the mirror, uttering certain sounds in cat-language (cats have a language), and, where possible, examining the back of the glass, that it at last becomes assured that what it sees is its *own* image. M. W.

Answers to Correspondents.

**** All communications for the Editor requiring early attention should reach the Office on or before the Saturday preceding the current issue of* KNOWLEDGE, *the increasing circulation of which compels us to go to press early in the week.*

HINTS TO CORRESPONDENTS.—1. *No questions asking for scientific information can be answered through the post.* 2 *Letters sent to the Editor for correspondents cannot be forwarded, nor can the names or addresses of correspondents be given in answer to private inquiries.* 3. *Correspondents should write on one side only of the paper, and put drawings on a separate leaf.* 4. *Each letter should have a title, and in replying to a letter, reference should be made to its number, the page on which it appears, and its title.*

REV. J. J. LAMBERT will have to discontinue KNOWLEDGE unless the Amateur Electrician appears systematically, and there is more of it. Quite so; we must have weekly a page of electricity.—J. HOPKINSON, L. MUSGRAVE, R. S. RIPLEY, O. S. are very much disappointed that we have not more geology. Our geological contributor has disappointed us, but—yes—we must have a weekly page of geology.—TELESCOPIST, MR. PATTERSON, JOHN BAKER, YOUNG ASTRONOMER (excuse me delaying reply to you for so long, but the questions and answers we are now dealing with we have been for some time collecting), M. S. JELLICOE, R. WATFORD, and others want regular astronomical papers with maps; this will occupy, say, two pages weekly.—BREVITY says, "Please teach me the Greek alphabet: thanks in anticipation." Why, certainly.—M. TENNANT is well pleased with our papers on Moths and Butterflies; trusts they will appear regularly. Quite so: column and a half a week (this thing is getting monotonous.)—J. M. PETERSEN wants to know why we have discontinued Dr. Wilson's papers. We have not discontinued, but,—Let them appear regularly, one page a week. Next J. LETTSOM knocks at our editorial door, "You have had very little lately of those charming writers, Mr. Grant Allen and Mr. Edward Clodd." We admit it, they are charming writers, and we have had little enough room for them lately. We must find two pages weekly for them.—J. Moss, IGNORAMUS No. 2, T. R., want more chemistry: a page a week.—J. HARGREAVE, R. T. P., M. TILLOTSON and others (come in), desire papers on metallurgy. Let us see if one page a week will do for this.—M. COMPTON and J. BONNEY (*come* in), are good enough to say that they like the Editor's papers, and wish he would give more. Shall we give three pages weekly?—R. C. and S. D. P. (COME in) want more Illusions.—R. SMITH, X. Y. Z., L. LUCAS, J. H. T., Q. ELLIS, and others (come in! and leave the door open), want to know what place text-book matter on Electricity, Chemistry, etc., should have in a magazine which ought to be a sort of explanatory newspaper of science? What, indeed! we must at least have five pages of other matter for every page of the kind you object to.—For OURSELVES, we remark that to oblige all and offend none is impossible; but to oblige all, without minding that some are offended, we want at least fifty pages of original matter besides ten or twenty pages for extracts of various sorts; in point of fact, we should provide a weekly shilling magazine for twopence. Fortunately, we have faith that the great majority of our readers are not quite so unreasonable as to expect this.—A CORRESPONDENT wishes to recommend a book by Mr. English, to those correspondents who wish to preserve flowers and fungi. Mr. English's book has already been mentioned in these columns.—A DERBYSHIRE SUBSCRIBER. The monthly notices of the Astronomical Society are issued as their name implies, monthly, during the session of the society, or from November until June, with one supplementary number during the recess. They appear about five weeks after each meeting, and it is stated that they cannot appear earlier; but, somehow, when I edited them, I managed to make them come out three weeks earlier. They were formerly only to be obtained by Fellows; but when I was secretary of the society I brought in a motion changing this undesirable state of things, and they can now be obtained for a payment of 10s. annually—whether they are worth this, I will hardly venture to say. Looking back over the last year or two, I find that on the average about one-twentieth part of each volume contains matter of interest, and about nineteen-twentieths of that appears (generally rather earlier) elsewhere.—S. W. (answered by A. H. P.). Mix quicklime with water into a thick paste; spread on the wood, and leave for a few minutes until of the shade required.—MR. BURTON FLETCHER (answered by John Browning). I beg to say that the machine ridden by Mr. Marriott in his wonderful ride through Wales was a "Humber" tricycle. At the time I wrote you the account of the ride, I was not aware what tricycle had been used, or I should certainly have given it. The address of the makers, which your correspondent may wish to know, is Humber, Marriott, & Cooper, Beeston, Nottinghamshire.

ENTOMOLOGY.

AN ENTHUSIASTIC SUBSCRIBER. "British Entomology," by John Curtis, is the best book on the subject. It is published in eight volumes, by Lovell, Reeve, & Co., 5, Henrietta-street, Covent-garden. I do not know the price, but I think it might be bought second-hand, by advertising, for a moderate sum. If AN ENTHUSIASTIC SUBSCRIBER will write to me, through the editor, stating what branches of entomology he wishes to study, I shall be pleased to recommend him the best manuals on the subject.—CLOANTHUS. R. Maclachlan has written a very good catalogue of Neuroptera; it is published by the Entomological Society, I believe. The British Museum has also a catalogue, but written in Latin; I do not know if it can be procured by the general public. The first is the more recent.

LETTERS IN TYPE.—Artificial Stone, by Ernest L. R.; Highland Celts, by Charles Stewart; Brain Waves and Memory, and Brain Troubles, by Dr. Jope; A Luminous Sea, by H. P. Vacher; Ferguson's Mechanical Paradox, by F.R.A.S.; Size of Rising Moon, by G. E.; Local Weather Lore, by Michael Rearden; Singular Mental Illusion, by W. H. Perkins; A Glass of Wine, by W. H. Johnston, and H. F.; Drunkenness, by J. A. Ollard and W. Bevil Browne; Tarnished Daguerreotypes, by A. Brothers; Physiological Experiment, by Z.; Skeleton Leaves, by E. C. N.; The Use of Drunkenness, by J. Ralph; Talking Canary, &c., by Charles L. Cane; Turkish Tobacco, by Tunbeko; Flint Jack, by J. E. Okill.

XUM

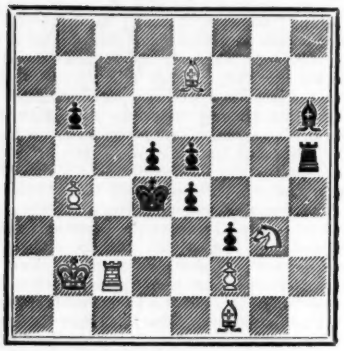
Our Chess Column.

By MEPHISTO.

PROBLEM No. 52.

By HERBERT JACOBS.

BLACK.



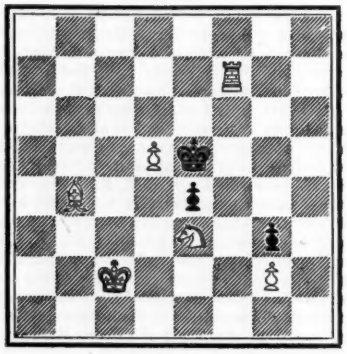
WHITE.

White to play and mate in two moves.

PROBLEM NO. 53.

By LEONARD P. REES.

BLACK.



WHITE.

White to play and mate in three moves.

The following is a brilliant specimen of a game at the odds of Pawn and two moves, played recently at Brighton.

Remove Black King's Bishop's Pawn.

WHITE. Mr. ——	BLACK. Mr. F. Edmonds.	WHITE. Mr. ——	BLACK. Mr. F. Edmonds.
1. P to K4		12. P takes P	P to B4 (*d*)
2. P. to Q4	P to K3	13. B to K3	Kt to Kt5
3. P to KB4 (*a*)	P to Q4	14. Q to B3 (*e*)	Kt takes B
4. P to K5	P to QB4	15. Q takes Kt	P takes P
5. P to B3	Kt to QB3	16. Kt takes P	B to B4
6. B to QKt5 (*b*)	Q to Kt3	17. R to Q sq	B to R3
7. P to QR4	Kt to R3	18. P to QKt3 (*f*)	R tks P (*g*)
8. Kt to B3	B to K2	19. Q takes R	R to KB sq
9. Castles	Castles (*c*)	20. Q to K3 (*h*)	B takes Kt
10. B takes Kt	P takes B	21. Q takes B	Q tks Q (ch)
11. Q to QB2	P takes P	22. R takes Q	R to B8 mate

NOTES.

(*a*) No improvement on 3 B to Q3.

(*b*) This is entirely useless. The giving of the KBP ceases to be of special value if no attack is directed on the exposed side of the King by means of B to Q3, with a view to Q to R5. Besides, there is no purpose in this move.

(*c*) Black has soon got over his disadvantage, and White must now proceed on a very shallow current.

(*d*) Black seizes a favourable opportunity to attack the weak part in White's game, and the advance of this Pawn is the beginning of some very fine play.

(*e*) 14 B to B2 would not have a much better result, as Black would also proceed with Kt takes B, and P takes P, and B to B4, &c.

(*f*) White wanted to save this Pawn, whereby he lost valuable time. His position, however, was very weak, and it would have been of far more importance to him to abandon this Pawn and play Kt to R3, with a view of playing it to QB2.

(*g*) A very fine combination, which wins by force.

(*h*) This move facilitates victory. Had White played 20 Q to Kt3, then B takes Kt (ch), followed by B takes R, and Black would still win by being a piece ahead.

ANSWERS TO CORRESPONDENTS.

*** *Please address Chess-Editor.*

Leonard P. Rees.—6. Q takes KtP must result to White's advantage. 6. Kt takes BP would be more attacking, but less safe.

A. A. B.—Best thanks for contribution.

Correct solutions of Problem No. 51 received from H. Seward, C. W. Croskey, H. V. T., E. J. G., Leonard P. Rees, C. J. Brown, Berrow, Geo. H. Bonner, Schmercke, T. Steele Sheldon, Tessir, H. B. Kingston, J. P.

W. H. G.—Problem 47. If 1. Kt to Kt2, B to Ksq. 2. Kt to B4 (ch), and Bishop mates.

A. Phelps Bennett.—Solution incorrect.

J. G. Dillon.—In Problem No. 50, P to B8 for Black's second move is impossible.

A MEDAL and prize, of the annual value of 20 guineas, has been founded by Charles William Siemens, D.C.L., F.R.S., "with the object of stimulating the Students of King's College, London, to a high standard of proficiency in metallurgical science." It is open to those who have, as matriculated students, studied in the Applied Science Department for two years, and who, either in their third year, or, if they remain in the Department for three years, in the succeeding year make metallurgy a special study. The first award will be made at the end of June, 1883, and will depend partly on an essay on some particular subject, partly on a written examination on the metallurgical lectures, and partly on actual work done in the laboratory. The subject for the essay for 1883 will be, "The Manufacture of Steel suitable for Ship and Boiler Plates." The essays are to be illustrated by freehand sketches and mechanical drawings to scale, and must be sent in to Professor Huntington on or before June 30.

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